

1 CLAIMS

2 1. A method for encoding Internet Protocol (IP) data into a format for  
3 transmission over a satellite system, comprising the following steps:

4 receiving an IP packet having an IP data block and header information;

5 encoding the IP packet into a variable-length multi-packet transport (MPT)  
6 frame having a data frame and header information so that the data frame of the  
7 multi-packet frame comprises the IP packet; and

8 encoding the variable-length MTP frame into one or more fixed-length  
9 MTP packets, each MPT packet having a data fragment block comprising at least a  
10 portion of the MTP frame and associated header information to designate what  
11 portion of the MTP frame is contained in the data fragment block.

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13 2. A method as recited in claim 1, wherein the header information of  
14 each MPT packet designates whether the data contained in the associated data  
15 fragment block is from a starting portion of the MPT frame, an ending portion of  
16 the MPT frame, or a middle portion of the MPT frame.

1           3.    A method as recited in claim 2, wherein the header information of  
2 each MPT packet comprises a one-byte header having a start-of-frame bit which is  
3 set if the data contained in the associated data fragment block of the MTP packet  
4 comprises the starting portion of the MTP frame and an end-of-frame bit which is  
5 set if the data contained in the associated data fragment block of the MTP packet  
6 comprises the ending portion of the MTP frame, the start-of-frame and end-of-  
7 frame bits both being reset if the data contained in the associated data fragment  
8 block of the MTP packet comprises the middle portion of the MPT frame.

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10           4.   A method as recited in claim 2, wherein the header information of  
11 each MPT packet comprises a multi-byte address in an event that the data  
12 contained in the associated data fragment block is the starting portion of the MPT  
13 frame.

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15           5.   A method as recited in claim 1, further comprising the step of  
16 calculating error correction information for the one or more MPT packets.

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18           6.   A method as recited in claim 5, further comprising the step of  
19 attaching the error correction information to one of the MPT packets.

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21           7.   A method as recited in claim 1, further comprising the step of adding  
22 a header including an address and a trailer with error correction information to  
23 each fixed-length MPT packet to form satellite-transmittable packets.  
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1 8. A method as recited in claim 7, further comprising the step of  
2 transmitting the satellite-transmittable packets.

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4 9. A transmission medium carrying the MPT packet embedded satellite-  
5 transmittable packets constructed and transmitted according to the steps in the  
6 method as recited in claim 8.

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8 10. A storage medium storing the MPT frame and MPT packets  
9 constructed according to the steps in the method as recited in claim 1.

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11 11. A computer programmed to perform the steps of the method as  
12 recited in claim 1.

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14 12. A computer-readable memory which directs a computer to perform  
15 the steps of the method as recited in claim 1.

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17 13. A method for encoding Internet Protocol (IP) data into a format for  
18 transmission over a satellite system, comprising the following steps:

19 receiving an IP packet having an N-byte IP data block, an A-byte transport  
20 protocol header, and a B-byte IP header;

21 constructing a variable-length multi-packet transport (MPT) frame having  
22 an M-byte data payload and a C-byte header;

23 inserting the entire (N+A+B)-byte IP packet into the M-byte data payload  
24 of the MPT frame; and  
25

1 constructing from the (M+C)-byte MPT frame one or more fixed-size  
2 multi-byte MPT packets, each MPT packet having at least one header to designate  
3 what portion of the MTP frame is contained in the MPT packet.  
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5 14. A method as recited in claim 13, further comprising the step of  
6 calculating error correction information for the one or more MPT packets.  
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8 15. A method as recited in claim 14, further comprising the step of  
9 attaching the error correction information as a multi-byte trailer to one of the MPT  
10 packets.  
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12 16. A method as recited in claim 13, further comprising the step of  
13 transmitting the MPT packets.  
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15 17. A storage medium storing the variable-length data group packet  
16 constructed according to the steps in the method as recited in claim 13.  
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18 18. A computer programmed to perform the steps of the method as  
19 recited in claim 13.  
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21 19. A computer-readable memory which directs a computer to perform  
22 the steps of the method as recited in claim 13.  
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1 20. A method for encoding network data packets into a format for  
2 transmission over a distribution system, comprising the following steps:

3 adding a header to a network data packet to form a variable-length multi-  
4 packet transport (MPT) frame; and

5 segmenting the MPT frame into one or more data fragment blocks; and

6 adding a header to each data fragment block to form fixed-length MPT  
7 packets of a size appropriate for transmission over the distribution system.

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9 21. A method as recited in claim 20, wherein the header of each MPT  
10 packet designates whether the data contained in the associated data fragment block  
11 is from a starting portion of the MPT frame, an ending portion of the MPT frame,  
12 or a middle portion of the MPT frame.

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14 22. A method as recited in claim 20, wherein the header of each MPT  
15 packet comprises a one-byte header having a start-of-frame bit which is set if the  
16 data contained in the associated data fragment block of the MTP packet comprises  
17 the starting portion of the MTP frame and an end-of-frame bit which is set if the  
18 data contained in the associated data fragment block of the MTP packet comprises  
19 the ending portion of the MTP frame, the start-of-frame and end-of-frame bits both  
20 being reset if the data contained in the associated data fragment block of the MTP  
21 packet comprises the middle portion of the MPT frame.

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23 23. A method as recited in claim 20, further comprising the step of  
24 adding padding bits as a trailer to the network data packet to form the MPT frame.  
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1           24.    A method as recited in claim 20, wherein the step of adding a header  
2 comprises the step of adding a header which designates what portion of the MTP  
3 frame is contained in the data fragment block.

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5           25.    A method as recited in claim 20, further comprising the step of  
6 adding an address to a first data fragment block.

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8           26.    A method as recited in claim 20, further comprising the step of  
9 calculating error correction information for the MPT packets.

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11          27.    A method as recited in claim 26, further comprising the step of  
12 attaching the error correction information to one of the MPT packets.

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14          28.    A method as recited in claim 20, further comprising the step of  
15 adding a header including an address and a trailer with error correction information  
16 to each fixed-length MPT packet to form satellite-transmittable packets.

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18          29.    A method as recited in claim 28, further comprising the step of  
19 transmitting the satellite-transmittable packets over a satellite distribution system.

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21          30.    A storage medium storing the MPT frame and MPT packets  
22 constructed according to the steps in the method as recited in claim 20.

1        31. A computer programmed to perform the steps of the method as  
2 recited in claim 20.

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4        32. A computer-readable memory which directs a computer to perform  
5 the steps of the method as recited in claim 20.

6  
7        33. A method for decoding computer network data from a satellite  
8 transmission signal, comprising the following steps:

9        receiving multiple satellite packets, individual satellite packets having a  
10 data payload;

11        removing the data payloads from the satellite packets, each data payload  
12 comprising a fixed-length multi-packet transport (MPT) packet having a data  
13 fragment block and associated header information;

14        using the header information of the MPT packet to arrange the MPT packets  
15 into a variable-length MPT frame;

16        reconstructing the MPT frame from the data fragment blocks of the MPT  
17 packets; and

18        extracting the network data from the reconstructed MPT frame.

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20        34. A storage medium storing the MPT packets and the MPT frame  
21 recovered according to the steps in the method as recited in claim 33.

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23        35. A computer programmed to perform the steps of the method as  
24 recited in claim 33.  
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1           36.    A computer-readable memory which directs a computer to perform  
2 the steps of the method as recited in claim 33.

3  
4           37.    A satellite transmission system, comprising:  
5           an encoding unit to encode a computer network data packet into one or  
6 more satellite packets, the encoding unit being configured to (1) add a header to  
7 the network data packet to form a variable-length multi-packet transport (MPT)  
8 frame, (2) segment the MPT frame into one or more data fragment blocks, (3) add  
9 a header to each data fragment block to form fixed-length MPT packets, and (4)  
10 add header/trailer information to each MPT packet to form one or more satellite  
11 packets;

12           a satellite transmission unit coupled to receive the satellite packets from the  
13 encoding unit, the satellite transmission unit transmitting the satellite packets over  
14 a satellite network;

15           a receiving unit to receive the satellite packets from the satellite network;  
16 and

17           a decoding unit coupled to the receiving unit to recover the MPT packets  
18 from the satellite packets, reconstruct the MPT frame from the MPT packets, and  
19 extract the network data packet from the MPT frame.

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21           38.    An encoding unit for encoding network data packets into a format  
22 for transmission over a satellite system, comprising:

23           means for adding a header to a network data packet to form a variable-  
24 length multi-packet transport (MPT) frame; and  
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means for segmenting the MPT frame into one or more data fragment blocks; and

means for adding a header to each data fragment block to form fixed-length MPT packets of a size appropriate for transmission over the satellite system.

39. An encoding unit as recited in claim 38, wherein the header for the MPT packets designates what portion of the MTP frame is contained in the data fragment block.

40. An encoding unit as recited in claim 38, further comprising means for adding padding bits as a trailer to the network data packet to form the MPT frame.

41. An encoding unit as recited in claim 38, further comprising means for adding an address to a first data fragment block.

42. An encoding unit as recited in claim 38, further comprising means for calculating error correction information for the MPT packets and attaching the error correction information to one of the MPT packets.

43. An encoding unit as recited in claim 38, further comprising means for adding a header including an address and a trailer with error correction information to each MPT packet to form satellite-transmittable packets.

1 44. A receiving unit for decoding computer network data received as  
2 part of a Vertical Blanking Interval (VBI) of a broadcast video signal, comprising:

3 a receiver to receive multiple satellite packets, individual satellite packets  
4 having a data payload comprising a fixed-length multi-packet transport (MPT)  
5 packet, each MPT packet having a data fragment block and associated header  
6 information;

7 a device driver coupled to the receiver;

8 one of the receiver or device driver being configured to remove the MPT  
9 packets from the satellite packets and use the header information of the MPT  
10 packet to arrange the MPT packets into a variable-length MPT frame, said one of  
11 the receiver or device driver being further configured to reconstruct the MPT  
12 frame from the data fragment blocks of the MPT packets and extract the network  
13 data from the reconstructed MPT frame.

14  
15 45. A computer-readable memory having a packet structure that can be  
16 encoded into a satellite data packet for transmission over a satellite network, the  
17 packet structure comprising:

18 a data block containing at least a portion of a computer network data  
19 packet;

20 a header positioned before the data block, the header designating whether  
21 the portion of the network data packet contained in the associated data block is a  
22 starting portion of the network data packet, an ending portion of the network data  
23 packet, or a middle portion of the network data packet;

24 in an event that the data block contains the starting portion of the network  
25 data packet, an address header positioned before the data block; and

1 in an event that the data block contains the ending portion of the network  
2 data packet, an error correction trailer containing error correction data positioned  
3 after the data block.

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5 46. A computer-readable memory as recited in claim 45, wherein the  
6 portion header is one byte, the address header is six bytes, and the error correction  
7 trailer is four bytes.

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